

Standing sound-waves in a half-open tube

Criteria: CE, MS

Aim

In a half-open tube the harmonics of the sound-waves can be found by investigating the absorption of the sound from a tuning fork.

Apparatus

Tube with sliding cork, tuning fork with resonance box, ruler.

Idea of experiment

By changing the length of the air-column in the tube observe when the volume of the sound drops down. Then the distance L between the closed end (node) and the open end (antinode) must fit the wavelength λ satisfying the formula: $\lambda = \frac{4L}{2n-1}$ with $n = 1, 2, 3, \dots$

The wavelength of the soundwave is found by reading the frequency of the tuning fork, then solving for λ in the formula $v = \lambda f$, where v is the velocity of sound, 343 m/s (at 20°C).

Make measurements with a tuning fork investigating the volume of the sound for different lengths of the air column in the tube. Be patient! Check results with the formula.

Actually the anti-node will be situated a little outside the open end of tube. See if you can confirm this. *Why is it so?*

Conclusion and Evaluation

Discuss your results considering random and systematic errors. Consider carefully how random errors can influence your results.

Discuss possible systematic errors and consider carefully which consequences these can have on your measurements and results. Suggest improvements.